

PATENT APPLICATION

Attorney Docket No. A03184US (98732.1)

TITLE OF THE INVENTION

Soccer Shoe Component or Insert Made of One Material and/or a Composite and/or  
Laminate of One or More Materials for Enhancing the Performance of the Soccer Shoe

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CROSS-REFERENCE TO RELATED APPLICATIONS

Priority of my U.S. Provisional Patent Application Serial Nos. 60/409,383 and  
60/409,386 both filed on September 11, 2002, incorporated herein by reference, is hereby  
claimed.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR  
DEVELOPMENT

Not applicable

REFERENCE TO A "MICROFICHE APPENDIX"

Not applicable

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to the field of performance enhancing shoe components or  
inserts for use in conjunction with various types of foot-ware. More particularly, the present  
invention relates to the field of performance enhancing shoe components or inserts which absorb  
and store energy of local loads and forces, through elastic deformation, and then return the  
energy to the shoe wearer, or to an object struck by a shoe, in useful form as the load is removed.

2. General Background of the Invention

There is a high demand for athletic equipment which enhances the performance of  
athletes. At all levels of athletic competition, small improvements in performance can be the  
difference between success and failure. At the highest levels of athletics, the difference of a few  
tenths or hundredths of a second is all that separates the elite athlete from the ordinary. For this  
reason, equipment which improves performance even slightly, will be desired in high demand.  
The newer materials used in tennis racket construction or golf club shafts are examples of

1 equipment which improves performance by absorbing and storing energy, then returns this  
2 energy in a useful form as the load is removed.

3 This high demand for performance enhancing athletic equipment includes the art of  
4 athletic shoes and shoe components. Most recent improvements in athletic shoes or athletic shoe  
5 components have been made for aesthetic reasons or for comfort or to reduce weight. Few  
6 changes in athletic shoes or their components have been for meaningful increases in athletic  
7 performance. Present athletic shoes and their components fail to provide an energy return to the  
8 wearer. Neither do they absorb energy and return energy to a ball or object struck by the shoe.

#### 9 Description of Prior Art

10 Athletic shoes typically comprise a fabric, leather or synthetic upper, an outsole including  
11 a treaded or cleated lower surface, and a midsole positioned between the outsole and the foot of  
12 the wearer. There may also be an insole positioned between the outsole and the foot of the  
13 wearer. If the shoe is not manufactured with an insole, a wearer may add an insole or replace the  
14 midsole with an insole.

15 The midsole of a conventional athletic shoe is generally formed from a flexible, resilient,  
16 relatively soft material in order to absorb shock that results from impact of the shoe with the  
17 ground. A typical outsole is made of a higher density, tougher, more rigid material in order to  
18 protect the shoe from degradation and to support the foot. The outsole must also be flexible in  
19 order to facilitate ease of movement of the foot during certain athletic motions.

20 The following U.S. Patents are incorporated herein by reference:

21 U.S. Patent Nos.: 4,454,662, 4,506,460, 5,203,793, 5,452,526, 5,572,804, 5,695,850  
22 5,960,566, 6,120,880, 6,205,683, 6,485,661.

23 U.S. Patent No. 5,572,804 discloses an inner sole for an athletic shoe that can have many  
24 degrees of stiffness, by the application of multiple inserts into the sole.

25 U.S. Patent No. 5,452,526 discloses a soccer shoe with an outsole stiffener; the stiffening  
26 inserts are molded into the outer sole.

27 U.S. Patent Nos. 6,120,880 and 5,694,850 disclose placing inserts into various portions of  
28 the insole of an athletic shoe to enhance performance.

1 U.S. Patent No. 6,205,683 discloses placing a torsional insert within the inner sole of an  
2 athletic shoe.

3 U.S. Patent No. 4,454,662 of 1984 issued to Stubblefield adds stiffening components to  
4 the arch and heel portions of the shoe. The present invention adds flexible components to just the  
5 front or to the front and outside edges of the shoe. The present invention may provide some  
6 measure of arch support, but little or no heel support. The shoe/sole/insert of an embodiment of  
7 the present invention will have a shape, location and function significantly different than the  
8 stiffening components in this patent.

9 There are numerous articles of footwear in the prior art in which inserts and shoe  
10 components are present in order to provide comfort, stability or support for the foot. For  
11 example, U.S. Patent No. 4,506,460 of 1985 issued to Rudy describes moderators and stabilizers  
12 located under the forefoot and heel. The purpose of these moderators and stabilizers is to cushion  
13 shock forces, provide improved support, control and stability, store energy and return energy to  
14 the wearer. These moderators and stabilizers are located under and vertically alongside the  
15 forefoot and heel of the wearer. The present invention's primary location will be the toe of the  
16 shoe with little or nothing supporting the heel and forefoot. The shoe/sole/insert of embodiments  
17 of the present invention will primarily be horizontally flat or slightly curved with little or no  
18 vertical element alongside the forefoot and heel. The shoe/sole/insert of embodiments of the  
19 present invention can differ in shape and location within the shoe.

20 U.S. Patent No. 5,452,526 of 1995 issued to Collins describes a two-part stiffener, the  
21 first portion of which stiffens the waist or shank of the outsole; and the second portion both  
22 stiffens and provides resiliency to the forepart of the of the outsole. The purpose of this two-part  
23 stiffener is to provide physical properties which are selected for the appropriate use of the shoe  
24 and to provide comfort to the wearer. These stiffeners operate to stiffen the shank or waist of the  
25 outsole and a fore part of the outsole in response to transverse flexure of the user's foot at the  
26 ball of the foot. These stiffeners are relatively complex in shape and located in various places  
27 throughout the outsole and arranged in a manner to resist flexure about the longitudinal axis of  
28 the shoe. The shoe/sole/insert of embodiments of the present invention will provide resilience  
29 primarily in response to vertical flexure of the user's foot at the toe, or even in front of the toe,  
30 and to a lesser extent, in response to some transverse flexure only at the outside edge of the foot.

1 The shoe/sole/insert of embodiments of the present invention will have relatively simple shapes  
2 with a location farther forward and whose function is not lateral support, but a vertical return to  
3 its original shape.

4 U.S. Patent No. 5,572,804 issued to Skaja et al. in 1996 details method of construction of  
5 shoe midsole components from a flexible high polymer resin. These shoe sole components are  
6 formed from two sheets of thermoplastic resin, with each sheet consisting of different materials  
7 having different properties and containing varying shapes and sizes of support members. These  
8 support members comprise inwardly directed indentations in each sheet of the thermoplastic  
9 resin which must be precisely aligned with the matching indentation. The shoe/sole/insert of  
10 embodiments of the present invention will not be restricted to only the midsole, nor will it  
11 consist of a plurality of shaped protrusions scattered throughout the midsole component material.  
12 The present invention can preferably be a thin, flat or slightly curved object consisting of a single  
13 or very few individual sizes and shapes extending to the front and side edges of the shoe outsole  
14 or midsole or inserted insole. Only if the present invention is hollow will it be important to more  
15 precisely match various protrusions or indentations.

16 U.S. Patent No. 5,695,850 issued to Crow in 1997 is a performance shoe component  
17 consisting of 1,4-polybutadiene and a natural or synthetic rubber. This shoe component is most  
18 advantageously placed beneath the ball of the foot. The purpose of that location is to improve  
19 the wearer's ability to leap higher or run faster or provide cushioning. The shoe/sole/insert of  
20 embodiments of the present invention will be most advantageously placed under and possibly  
21 beyond the front edges and outside edges of the shoe. This location is intended to maximize the  
22 absorption of energy and to return a portion of this energy to the object struck.

23 U.S. Patent No. 5,960,566 issued to Brown in 1999 and U.S. Patent No. 6,485,661 issued  
24 to Brown in 2002 both consist of a composite material orthotic insert configured to enhance  
25 control over the motions of the foot within the shoe. The stated purpose of the insert is to control  
26 the movements of certain joints of the foot during walking and running. This orthotic insert is  
27 positioned under the heel and forefoot. The shape and position of the insert and its purpose in the  
28 aforementioned patent is clearly distinguishable from the shoe/sole/insert of embodiments of the  
29 present invention.

1 U.S. Patent No. 6,120,880 issued to Crow in 2000 is a continuation of U.S. Patent No.  
2 5,695,850. The characteristics which distinguish the present invention from this patent are the  
3 same as those outlined above.

4 U.S. Patent No. 6,205,683 issued to Clark et al. in 2001 is for an insole board which  
5 includes a shock diffusion plate located under the heel and midfoot. The location, shape and  
6 purpose of the shoe/sole/insert of embodiments of the present invention are clearly  
7 distinguishable.

#### 8 BRIEF SUMMARY OF THE INVENTION

9 The prior art does not anticipate the basic concepts of the present invention. The present  
10 invention will absorb and store energy from the foot at foot-strike and return some of this energy  
11 to the object being struck. The present invention, incidentally, may also cushion the foot, leg and  
12 body; provide foot stability and motion control; reduce fatigue; extend the float time of a runner  
13 and increase the jump height of the wearer. The present invention is intended to absorb, store and  
14 return energy to the object struck, which would otherwise be lost using the existing shoe  
15 components and inserts.

16 The present invention can comprise essentially a light-weight flat, or slightly curved, thin  
17 unitary object made of a flexible material or materials, which can be integrated into a shoe's  
18 outsole and/or midsole and/or insole. The object may extend from the heel or arch of the foot to  
19 or beyond the toes of the foot. The object may even curve over the toe, producing a cap, which  
20 extends beyond and over the top of the toes. The object may take various shapes dependent upon  
21 the wearer's preferences and intended use.

22 The intent of the present invention is to provide shoe components which impart energy  
23 into the object struck. It is a feature of some embodiments of the present invention that it be  
24 placed as far forward and/or laterally as reasonable, in order that the ability to effectively use the  
25 shoe for purposes other than striking the object, is not significantly compromised.

26 The intent of the shoe component of the present invention is that a struck object travel  
27 faster and/or further than would be possible without this shoe component. Placing the present  
28 invention at the farthest end of the arc of the kicking leg and foot would consequently enable the

1 maximum amount of absorption of energy by the component of the present invention. The more  
2 energy absorbed, the more energy would be available to transfer to the struck object.

3 The present invention may also provide more comfort to the wearer. Energy absorbed by  
4 the present invention will decrease the energy absorbed by the bones, muscles, joints, ligaments  
5 and tendons of the toes, leg and foot. This would reduce physical fatigue and/or pain. Using the  
6 present invention's energy return characteristics may also increase the ability of the wearer to  
7 jump higher, or to run faster by increasing the wearer's stride length. These shoe components  
8 may improve athletic performance in a variety of athletic endeavors.

9 The material or materials used in the manufacture and the shape or shapes of the present  
10 invention and the location of the present invention within the shoe may be varied depending  
11 upon the wearer's intended use. Specific applications may include increased comfort and foot  
12 stability, better motion control, an increase in energy efficiency, a decrease in fatigue and risk of  
13 injury and many other desired advantages.

14 The primary material for the components of the present invention will preferably be  
15 graphite and carbon, with more graphite than carbon. A ratio of 10% carbon to 90% graphite will  
16 be stiffer than a ratio of 20% carbon to 80% graphite. The graphite fibers may be unidirectional,  
17 on a bias or woven. The present invention may be 100% carbon or 100% graphite, or some  
18 combination of the two; this material(s) may be laminated or combined with another material or  
19 other materials. There may be no graphite or carbon in the components of the present invention,  
20 but one or both of these are the primary materials used in the shafts of modern golf clubs and  
21 tennis rackets. The technology which has been recently been employed to increase the distance a  
22 golf ball travels when struck with the newer golf clubs; or the increase in velocity of a tennis ball  
23 struck by the newer tennis rackets, is a technology which can be used with the present invention.  
24 Other materials used in tennis rackets include kevlar, fiberglass and titanium. Golf club shafts are  
25 usually graphite or metal. The graphite, titanium and metal may be alloys. The components of  
26 the present invention can be made of the material or combinations of materials, whether in  
27 composite or laminate form, used in the construction of newer models of tennis rackets and golf  
28 club shafts.

29 The present invention includes a performance enhancing shoe component for a soccer  
30 shoe, the soccer shoe comprising a shoe upper and at least a sole secured to the upper such that a

1   wearer's foot is positioned within the upper and above the sole, which incorporates one or more  
2   preformed objects embedded in an outsole body, or which constitutes the entire outsole; the  
3   component of the present invention will operate to deflect, without permanent deformation, in  
4   response to an applied load creating a deflecting stress and then to return to its original shape  
5   upon removal of the applied load causing the deflecting stress, the component of the present  
6   invention operating to absorb, redistribute and store the energy of localized loads applied thereto  
7   through deflection and, by returning to its original shape, to return energy to the wearer and/or to  
8   an object struck by the shoe in such manner so as to impart to the struck object applying the load  
9   some portion of the energy produced by the applied load; the component can be made of one  
10   type of material or of a composite of one or more type of materials. For example, the component  
11   can be made of a laminate of one or more type of materials. The performance enhancing shoe  
12   component can have one or more shapes in one or more locations within the outsole shoe  
13   component depending upon the particular performance enhancing characteristics desired by the  
14   wearer.

15       The present invention includes a performance enhancing soccer shoe component for a  
16   soccer shoe which comprises a shoe upper and at least two soles, one of which is the outsole  
17   secured to the upper and a midsole which is located between the wearer's foot and the outsole.  
18   This midsole can incorporate one or more preformed objects embedded in the midsole material,  
19   or the component can constitutes the entire midsole, and it also operates to deflect, without  
20   permanent deformation. This midsole can be added as part of the manufacturing process of the  
21   new shoe. This performance enhancing shoe component can include a midsole made of one type  
22   of material; alternatively, the midsole can be a composite of one or more type of materials - in  
23   such a case, it could be made of a laminate of one or more type of materials. The component  
24   can have one or more shapes in one or more locations within the midsole depending upon the  
25   particular performance enhancing characteristics desired by the wearer.

26       The present invention includes a performance enhancing soccer shoe insert which can be  
27   placed between the outsole and/or midsole and the wearer's foot. This inserted insole can contain  
28   one or more preformed objects embedded in the insole material, or the insert can constitute the  
29   entire insole, and it also operates in a manner consistent with previously described embodiments  
30   of the invention. This "after market" inserted insole can be added after the shoe has been  
31   manufactured and sold. The insole can be made of one type of material, or it can be made of a

1 composite of one or more type of materials, in which case it could be made of a laminate of one  
2 or more type of materials. The components in the insole can have one or more shapes in one or  
3 more locations within the shoe insert depending upon the particular performance characteristics  
4 desired by the wearer.

5 The present invention also includes a soccer shoe including the component or the insert  
6 of any embodiment of the present invention.

## 7 BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

8 For a further understanding of the nature, objects, and advantages of the present  
9 invention, reference should be had to the following detailed description, read in conjunction with  
10 the following drawings, wherein like reference numerals denote like elements and wherein:

11 Figure 1 is a side view of a preferred embodiment of the apparatus of the present  
12 invention;

13 Figure 2 is a top view of a preferred embodiment of the apparatus of the present  
14 invention;

15 Figure 3 is a bottom view of a preferred embodiment of the apparatus of the present  
16 invention;

17 Figure 5 is a top or bottom view of a midsole or inserted insole illustrating an  
18 embodiment of the present invention as the entire outsole midsole or insole;

19 Figures 6, 7, 8, 9 and 10 are top or bottom views of the outsole/midsole/insole insert  
20 illustrating alternative embodiments of the present invention;

21 Figure 11 is a cross section of a toe of a soccer shoe showing the shoe and an  
22 embodiment of the present invention located within the shoe outsole;

23 Figure 12 is a cross section of the heel of a shoe and an embodiment of the present  
24 invention located within the outsole;

25 Figure 13 is a cross section of a toe of a shoe showing an embodiment of the present  
26 invention of the present invention located within the midsole of the shoe; and

27 Figure 14 is a cross section of the heel of a shoe showing an embodiment of the present  
28 invention located within the midsole of the shoe.

## 29 DETAILED DESCRIPTION OF THE INVENTION



1           The athletic shoe shown for illustrative purposes is a soccer shoe even though the present  
2 invention may be used in other types of athletic or any other type of shoe. The soccer shoe  
3 shown in Figure 1 is of generally conventional form. The shoe 1 has an upper 2 made of leather  
4 or similar material, with a tongue 3 and laces 4. The shoe Figure 1 has an outsole 5 and a midsole  
5 6 either or both of which may incorporate an embodiment of the present invention. The outsole 5  
6 also incorporates molded or screw threaded studs or cleats 8 which come in contact with the  
7 ground when the shoe 1 is worn.

8           Figure 2 is a top view of a shoe midsole 6 with an illustration of a component 7 of an  
9 embodiment of the present invention. This midsole 6 is worn between the foot and the outsole 5.  
10 The material 10 surrounding the shoe midsole of an embodiment of the present invention may  
11 consist of air, gas, foam rubber or other cushioning material.

12           Figure 3 is a bottom view of a shoe outsole 5 illustrating a component 17 of an  
13 embodiment of the present invention embedded in the outsole 5.

14           Figure 4 is a top view of a shoe insole insert 9 including a component 27 of an  
15 embodiment of the present invention. Insert 9 can be inserted in an otherwise standard soccer  
16 shoe after the shoe is manufactured and purchased.

17           Figure 5 is both a top or bottom view of an outsole 15, a midsole 16, or an inserted insole  
18 19 illustrating an embodiment of the present invention where the entire outsole 15, midsole 16 or  
19 insole 19 is made of stiff material of the present invention.

20           Figures 6, 7, 8, 9 and 10 are top or bottom views of the outsole/midsole/insole insert  
21 illustrating alternative embodiments of the present invention, namely components 37, 47, 57, 67,  
22 and 77, respectively, with material 10 surrounding them or, when these components are  
23 embedded in the outsole, any standard commercially available outsole material is used in place  
24 of material 10.

25           Figure 11 is a cross section of the toe of shoe 1 showing the shoe upper 2 and component  
26 7 of an embodiment of the present invention (or any other component shown in Figures 2-10)  
27 located within the shoe outsole 5.

1           Figure 12 is a cross section of the heel of the shoe 1 and component 7 of an embodiment  
2 of the present invention (or any other component shown in Figures 2-10) located within the shoe  
3 outsole 5.

4           Figure 13 is a cross section of the toe of a shoe 1 showing component 7 of an  
5 embodiment of the present invention (or any other component shown in Figures 2-10) of the  
6 present invention of the present invention located within the midsole 6 of the shoe.

7           Figure 14 is a cross section of the heel of the shoe 1 showing component 7 of an  
8 embodiment of the present invention (or any other component shown in Figures 2-10) within the  
9 midsole 6 of the shoe.

10          Figures 13 and 14 may also be used to illustrate a cross section of an embodiment of the  
11 present invention located within an insole inserted into the shoe.

12          In the drawings the shoe sole/insert of the present invention is shown in striped lines  
13 whether located in the outsole, midsole, or as part of an inserted insole. The components of the  
14 present invention can be manufactured into the outsole and/or the midsole. If the component is  
15 manufactured into the outsole, the material may be a color different from the outsole. This  
16 different color would be desirable to distinguish the shoe from shoes without the components of  
17 the present invention in the outsole. The insert of an embodiment of the present invention may  
18 also be incorporated into an innersole, which is inserted into the shoe at some point after the  
19 manufacture of the other components of the shoe.

20          The shoe sole/insert of an embodiment of the present invention can be made of one  
21 material, or of a combination of natural and/or man-made materials. The choice of material or  
22 combination of materials, the shape of the materials, and the location of the component within  
23 the shoe can be determined by the wearer's desire to optimize specific performance enhancing  
24 characteristics of the shoe. The primary specific characteristic of the shoe sole/insert of the  
25 present invention is to efficiently return energy that would be wasted without the shoe sole/insert  
26 of the present invention. In response to an applied load, such as kicking a ball or striking the  
27 ground, the shoe sole/insert of the present invention will temporarily deform. Upon removal of  
28 the applied load, or a progressive reduction of the applied load, the shoe sole/insert of the present  
29 invention will return to its original shape. This absorption of energy and the return of otherwise

1 wasted energy to the wearer and/or to the object struck by the shoe of the wearer is the essential  
2 performance enhancing characteristic of the present invention. Other applications of the present  
3 invention may include lighter weight, more comfort, less fatigue, more stability, less injury risk,  
4 better foot control, better foot support, or even better outward appearance of the shoe.

5 The shoe sole/insert of an embodiment of the present invention should have a relatively  
6 high tensile strength. The material or materials should also be elastic and have a strong tendency  
7 to return to an unstressed state once it is free from the stress of impact. The material or materials  
8 should also possess good fatigue resistance so that it will withstand repeated cycles of deforming  
9 when stressed and rebounding when the stress is removed. The material or materials may be a  
10 composite or be laminated in order to achieve desired combinations of the specific applications  
11 of the shoe. The material should have a modulus of elasticity of at least 250, 000 psi. Typical  
12 materials are high modulus plastics such as polycarbonate materials (modulus of 300,000), ABS  
13 injected molded plastic, fiberglass composites (modulus of 3,000,000), graphite composites  
14 (modulus of 9,000,000), carbon composites, and various types of steel.

15 The shoe sole/insert of the present invention should be lightweight and thin. The  
16 thickness may be constant or may vary depending upon the desires and the intended use of the  
17 wearer. The cross sectional thickness of the present invention will vary, dependent upon the  
18 material used and the wearer's desires, but the thickness is preferably in the range of 0.005 inch  
19 to 0.10 inch. The shoe sole/insert of the present invention may also be hollow. The shoe  
20 sole/insert of the present invention may extend the length of the foot, it may be shorter or longer  
21 than the foot, or extend beyond or over the heel and/or toes of the foot. The shoe sole/insert of  
22 the present invention may be flat or round and/or any shape or combination of shapes, the  
23 surface may be flat, curved, grooved or corrugated. The shoe sole/insert of the present invention  
24 may consist of one or more parts, which may be connected or function independent of each  
25 other.

26 The shoe sole/insert of an embodiment of the present invention may be incorporated into  
27 the outsole and/or midsole and/or insole during the manufacturing process. The manufacturer  
28 may also leave a pocket or space in the outsole and/or midsole and/or insole for a separately  
29 manufactured component of the present invention. This would allow individual choice of a  
30 variety of materials or shapes in the wearer's discretion. The same shoe may then be able to

1 accommodate a broad range of stiffer or more flexible shapes so that the wearer can snap the  
2 desired component into the pocket or space, then remove it at will, and snap in another variant of  
3 the component as desired.

4 While the foregoing description has referred particularly to soles for soccer shoes (and is  
5 preferably used with soccer shoes), the invention is also applicable to articles of footwear,  
6 whether athletic footwear or not, and both with and without studs. For example, the invention  
7 can be applied to casual or dress shoes, to tennis shoes and training shoes.

8 All measurements disclosed herein are at standard temperature and pressure, at sea level  
9 on Earth, unless indicated otherwise. All materials used or intended to be used in a human being  
10 are biocompatible, unless indicated otherwise.

11 The foregoing embodiments are presented by way of example only; the scope of the  
12 present invention is to be limited only by the following claims.  
13